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Land administration infrastructures for sustainable development

Submitted by the International Federation of Surveyors**

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INTRODUCTION

The last decade has seen moves towards establishment of fully digitised cadastral systems throughout the world. It is recognised that cadastral systems are not ends in themselves. They are key components of more global land administration systems. These systems are tailored to facilitate an efficient land market as well as effective land-use administration and thereby, more generally, promote economic development, social cohesion and sustainable development. Digital cadastral systems thus must serve a multi-purpose use and thereby meet the challenge of a modern GIS and IT environment.

New communication technologies and the WWW have a dramatic effect on the evolving spatial information marketplace. The use of GIS in modern land administration and decision-making require standards and access tools that guide the multipurpose use of the data. Adoption of policies on Spatial Information Infrastructures provides such guidance through design of adequate concepts for data sharing and management. The paper will present a number of examples to illustrate this multi-purpose use.

It is recognised that it is difficult if not impossible to conceive this multi-purpose role without fully understanding the cultural and judicial context of which the land administration system is an integral part and which it serves. The paper therefore also discusses the issue of establishing appropriate institutional and organisational infrastructures as a crucial key for achieving sustainability in any society. In this regard decentralisation is seen as a significant key to sustainable development.

THE GLOBAL CHALLENGES

The main global drivers for change in the spatial information world can be identified as technology development, micro-economic reform, globalisation, and sustainable development (Williamson and Ting, 1999). These global drivers therefore also influence the design of adequate land administration systems and infrastructures

Technology development is the major driving force in changing the face of the spatial information world. The GPS technologies for measuring have revolutionised the traditional surveying discipline and the high-resolution satellite imagery tends to

revolutionise the mapping discipline. The database technologies for storage of large data sets and the GIS technologies for data management, analysis and manipulation arguably have had the greatest impact on the spatial information environment. And in the future the communication technologies such as the WWW and the Internet will become the focus of attention for viewing and using spatial data.

Micro-economic reform in many countries has had a dramatic impact on the spatial information environment. The micro-economic reform initiatives represent the institutional and governmental side of the changes observed during the latest two decades. This includes initiatives such as privatisation, decentralisation, downsizing, cost recovery, performance contracts, quality assurance, public/private partnership, and other policies to ensure service delivery and cost effectiveness. These initiatives have changed the focus from the pure technological issues to include also the more managerial components of designing national spatial data infrastructures.

Globalisation is becoming a reality driven by IT and communication technologies. A globalised world is one in which political, economic, cultural, and social events become more interconnected. The process includes that events in one part of the world increasingly have potential to impact on people and societies in other parts of the world. Globalisation widens the perspectives from the local to the global level. This should lead to a world movement towards improving the quality of lives of people by thinking, working together on common concerns. Globalisation has a social, economic, political, as well as an educational dimension. The www is the most graphic example of this trend, even if the full potential of the web as an educational resource is still to be seen.

Sustainable development will be a driving force in policies developed through the decades ahead. Sustainable development means development that effectively incorporates economic, social and environmental concerns in decision making for development which thereby should "meet the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission, 1987). The professional areas of land administration and, more generally,

land management include decision making of such a multidisciplinary nature to be carried out at national, regional and local level of government.

A GLOBAL LAND ADMINISTRATION PERSPECTIVE

The International Federation of Surveyors (FIG, 1995) defines a cadastre as a parcel based and up-to-date land information system containing a record of interests in land (e.g. rights, restrictions and responsibilities). It usually includes a geometric description of land parcels linked to other records describing the nature of the interests, ownership or control of those interests, and often the value of the parcel and its improvements. It may be established for fiscal purposes (valuation and taxation), legal purposes (conveyancing), to assist in the management of land and land-use planning (planning and administration), and enables sustainable development and environmental improvement.

The cadastral infrastructure includes a unique identification of the land parcels deriving from the cadastral surveys. The cadastral identification is then seen as the core component of any land information system. It is argued that within the next ten years such land information systems will form an integral part of a model of our man made and natural environment. The model will build on the core cadastral and topographic data sets which will be complete on a country wide basis and kept up-to- date. The focus will be on providing land information to the mass market to support the land market, financial and business sectors, environmental management, land administration, urban systems and community information systems (Williamson, 1997).

A vision for the future role of the cadastre in a global land management perspective should reflect this scenario of IT development. This means that the cadastral systems must provide adequate information on the land parcels to be presented in a variety of interfaces. The design and maintenance of cadastral systems must reflect this multi-purpose use.

A cadastral vision of the future, as presented in the UN Bogor Declaration 1996, is to: "develop modern cadastral infrastructures that facilitate efficient land and property

markets, protect the land rights of all, and support long term sustainable development and land management".

In Figure 1, the cadastral system is seen as the basic infrastructure to support the different systems in the area of land management.

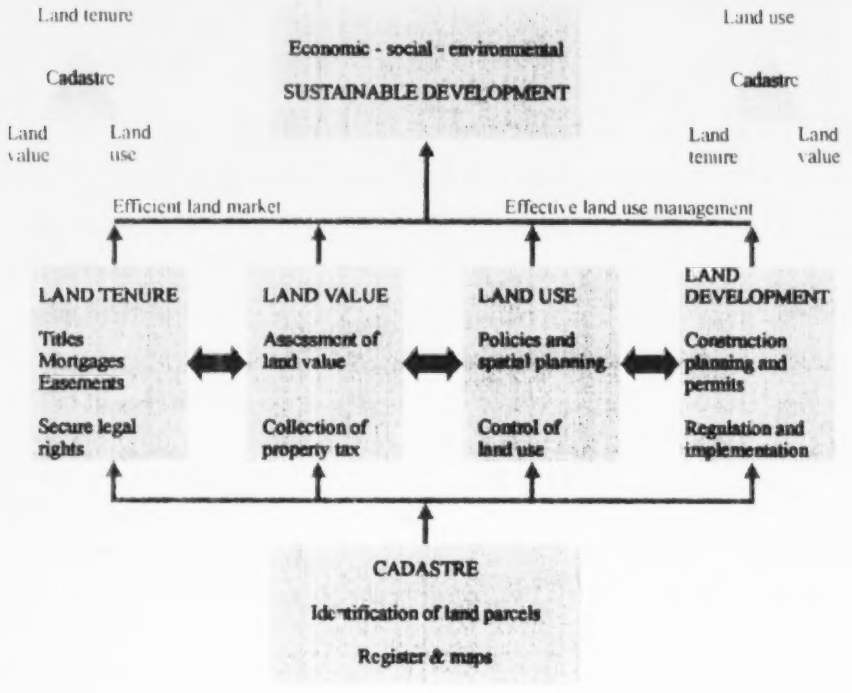


Figure 1. A Global Land Administration Perspective in support of Sustainable Development

The systems supported by the cadastral infrastructure are:

- Land Tenure System, to secure legal rights in land such as titles, mortgage and easements
- Land Value System, to assess the value of land and properties and to levy land taxes on that basis
- Land-Use Control System, to enable comprehensive and detailed land use planning control of land use

- Land Development System, to enable regulation and implementation in change of land use.

These systems are interrelated. The actual economic and physical use of land and properties influences the land value. The land value is also influenced by the possible future use of land as determined through zoning and land-use planning regulations. And the land-use planning and policies will, of course, determine and regulate the future land development.

The design of adequate systems in the area of Land Tenure and Land Value should lead to the establishment of an efficient land market; and the design of adequate systems in the areas of Land-Use Control and Land Development should lead to an effective land-use administration. The combination of an efficient land market and an effective land-use administration should then form the basis for a sustainable approach to economic, social and environmental development.

The cadastral identification of land parcels permeates through the land administration and land management systems and provides the basic infrastructure for running the interrelated systems within the areas of Land Tenure, Land Value, and Land Use. The success of a cadastral system is a function of how well it achieves these broad social and economic objectives

EVOLUTION OF LAND ADMINISTRATION SYSTEMS

Throughout the world, the cadastral concept has developed significantly over the past few decades. The most recent examples are current world concerns of environmental management, sustainable development and social justice. Due to this, multi-purpose cadastres are increasingly seen as fundamental to economic development, environmental management and social stability in both the developed and developing worlds (Williamson and Ting 1999). The cumulative evolution of the humankind/land relationship and the consequent evolution of cadastral applications are shown below.

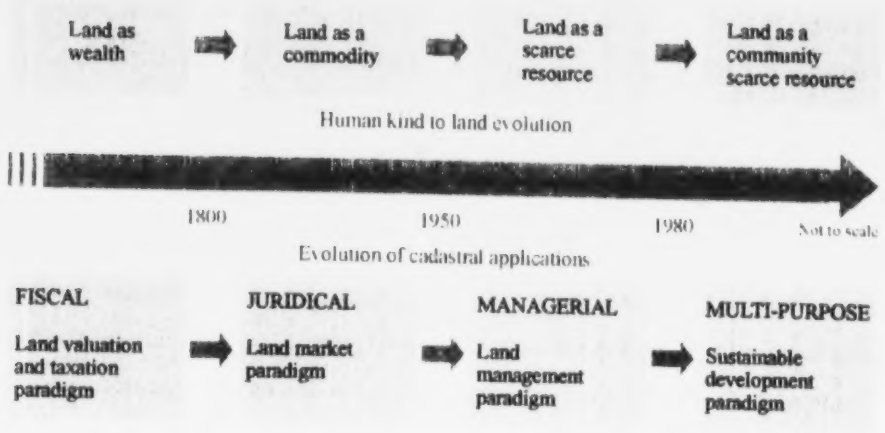


Figure 2. Evolution of Land Administration Infrastructures

The Danish Evolution

The Danish cadastre, which derived from the results of the enclosure movement, was established in the year 1844. The main purpose was the collection of land taxes from the agricultural holdings based on a valuation of the yielding capacity of the soil.

From the beginning the cadastre consisted of two parts: the cadastral register and the cadastral maps. Both of these components have been updated continually ever since. As a result, the cadastre was also used to support the land ownership and land transfer system. The Land Registry System was established in 1845 at the local district courts for recording and protecting legal rights of ownership, mortgage and easements.

In the late 1800´s the cadastre changed from being a fiscal cadastre primarily as a basis for land valuation and taxation to a legal cadastre supporting a growing land market. This evolu. The new system of title registration was based on the cadastral identification and a close interaction between the two systems was established.

During the first half of the 1900´s land was increasingly seen as a commodity and the focus was on agricultural production and industrial revolution. Land-use regulations were introduced to improve agricultural productivity and at the same time sustain the social living conditions in the rural areas. These regulations were based on the cadastral

information. In fact, the yielding valuation unit was used to control development in the rural areas until the late 1960´s. tion was completed in the first years of the 1900´s when taxation became based on the market value. Simultaneously, in the 1920´s a new Land Book System was established

The 1960´s introduced a close interaction between the cadastral process (e.g. subdivision) and the relevant land-use regulations. Any property formation or change of property boundaries must include the necessary documentation showing the approval of the future land use according to relevant planning regulations and land-use laws.

An administrative reform was adopted in the early 1970´s to reorganise regional and local administration. The reform reduced the number of counties from 25 to 14 and the number of local authorities from almost 1,400 to 275. The reorganisation created the basis for transferring a number of responsibilities and decision-making power to the counties and especially to the municipal councils by means of decentralisation. Each authority levies taxes (income and land taxes) and the elected councillors are responsible for utilising the revenue. Today, the local authorities administer more than 50 % of the total public expenditure.

Land was increasingly seen as a community scarce resource and zoning and planning regulations were introduced to control land development. Environmental concerns appeared in the late 1970´s and have developed to be the major issue through recent years. Today, comprehensive planning and environmental protection is seen as the main tools to secure sustainable development. New land administration infrastructures based on the modern IT-opportunities have evolved to support these processes of sustainable land management.

The Nordic Way

Cadastral systems have a long history in the Nordic countries. Historically the purpose of the cadastre was to collect land taxes. Today the cadastre has a much broader objective, and it is accepted that when cadastral information is a part of integrated information systems, it can improve the efficiency of the land transfer process as well as the overall process of land management. The structure of the cadastral systems,

however, varies between the Nordic countries according to the cultural and judicial setting of the individual country. The key characteristics of the systems are presented in Figure 3 (Enemark, 1998*b*).

Country	Denmark	Norway	Sweden	Finland
Area	43,000 sq. Km	324,000 sq. Km	450,000 sq. km	337,000 sq. Km
Population	5.2 mill	4.2 mill	8.6 mill	5.0 mill
Properties	About 1,5 mill	About 2 mill	About 3 mill	about 2 mill
National cadastral authority	National Survey and Cadastre under the Ministry of Housing	National Mapping Authority under the Ministry of Environment	National Land Survey under the Ministry of Environment	National Land Survey under the Ministry of Agriculture
Cadastral surveys	Licensed surveyors in private practice	Municipal Survey Authorities; Licensed surveyors in private practice will be introduced	State Survey Authorities at county level; and some Municipal Survey Authorities	State Survey Authorities in rural districts; and some City Survey Authorities
Property Register Authority (land parcels)	National Survey and Cadastre maintaining the cadastral register and the digital cadastral maps.	Municipal Survey Authorities; and the National Survey Authority maintaining the GAB-register	County and Municipal Survey Authorities; and the National Land Survey maintaining the Land Data Bank System	District and City Survey Authorities and the National Land Survey maintaining the Real Estate Register
Land Register Authority (title and mortgage)	Local district courts (Ministry of Justice)	Local district courts (Ministry of Justice)	Local district courts (Ministry of Justice)	Local district courts (Ministry of Justice)
Land Information System	Interactive subsystems linked together through a Cross Reference Register	GAB – register linked with the Land Book	Land Data Bank System	Central Information System on Real Estate Data

Figure 3. Key characteristics of the cadastral systems in the Nordic countries.

The Norwegian cadastral system is presently being revised. A new cadastral law is under preparation to come into force by the year 2001/2002. As a result of the new law the Danish and Norwegian systems are now coming closer together, just like the systems in Sweden and Finland are rooted in the same tradition. However, as a common trend in all the Nordic countries there is a development towards a multipurpose use of computerised cadastral information through interactive GIS-systems and through the Internet.

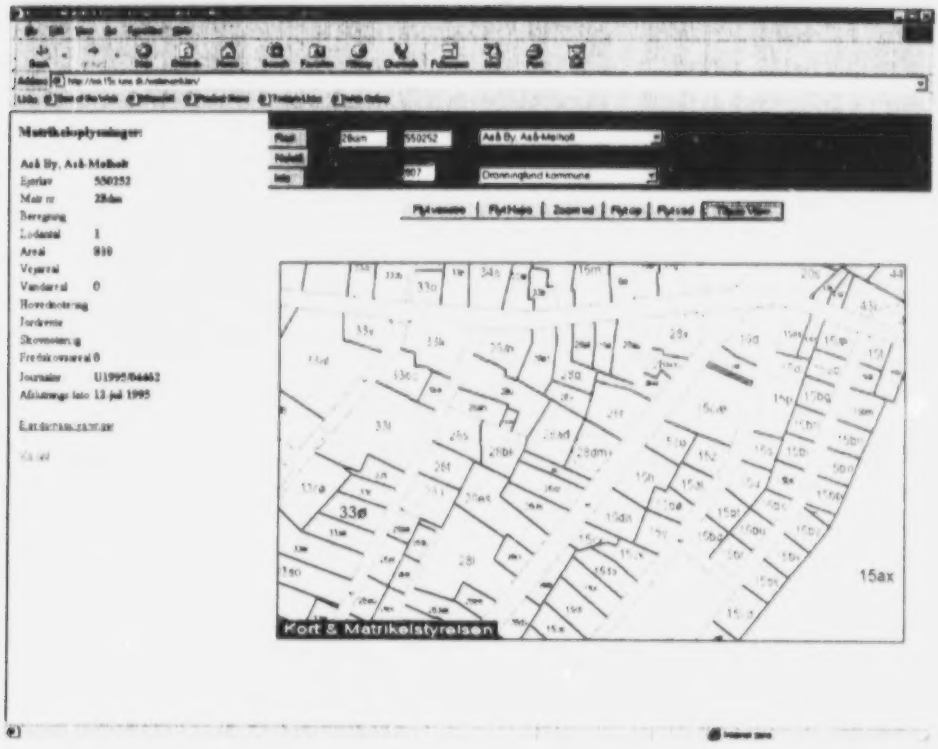


Figure 4. The Danish Cadastral Information System on the Internet. The textual information is presented on the left side of the screen by pointing on the relevant property (circled) in the map or by asking for this property by cadastral number or address. Zoom facilities etc. is available as well.

A cadastral system has two components: a textual and a spatial. The spatial part consists of the cadastral maps covering the whole country and the survey plans showing the property boundaries of the individual properties. Even though the cadastral systems are now clearly user-driven, it must be argued that within a country/jurisdiction there can be only one cadastral system and only one cadastral map providing the basic infrastructure. This means that the cadastral system must be able to serve all kind of spatial information ranging from a scale of 1:1 to a scale of 1:25,000.

To face this problem it must be understood that the origin and main objective of cadastral systems historically has been to identify the land parcels for the purpose of levying land taxes and/or securing legal and economic rights to land.

The cadastral process thus is focused on the relative accuracy between the parcel boundaries. However, today some users such as local authorities and the utilities will see the absolute accuracy as necessary in order to combine the legal property features in the cadastral map with the spatial features in the large-scale topographic map. The tension between the relative and absolute accuracy of the boundaries may therefore be seen as the main problem of establishing multi-purpose cadastral systems. The relative accuracy must be maintained for legal reasons while an absolute accuracy should be obtained for the reasons of multi-purpose use (Enemark, 1998*a*).

The problem of maintaining the digital cadastral map as described above is just one example of the complexity of the digital spatial information environment. Another example is the efforts to establish a concept for digital lodging of the survey plans and cadastral information from the private surveyor in case of parcelling out or change of boundaries. This process of digital lodging should as well be organised to serve all users even if this may an ambitious goal. This problem is currently addressed in Denmark and Finland using different approaches based on the cultural and judicial setting of the systems.

In conclusion, the spatial information management environment is changing and so is the nature of the spatial data infrastructures. Traditional isolated approaches only supporting individual purposes such as land titling or land taxation are not sustainable. They are being replaced by multi-purpose systems where information on land related issues can be integrated for a wide range of purposes, and displayed e.g. through the WWW to a wide range of users.

SPATIAL DATA INFRASTUCTURES

Spatial data infrastructures in a land administration framework provide mechanisms for sharing geo-referenced information. These mechanisms are conceptual, political and economic, and they are of course interrelated. Key elements include adoption and implementation of technical standards, adoption of access policies and cost recovery policies, and design of co-operative relationships between governmental levels and between the public and private sector.

- Conceptual mechanisms include design of organisational concepts for data sharing and custodianship, e.g. a centralised or a decentralised approach. The process of designing concepts for data sharing will always include some political and economic aspects as well. Examples of such concepts are given below.
- Political mechanisms include provision of an effective institutional framework and the distribution of power between the governmental levels. It also includes design and adoption of policies for access to data, e.g. policies for protection of privacy such as personal and financial integrity of the individual.
- Economic mechanisms include cost recovery policies as well as strategies for distribution and maintenance. The key issue here is provision of a universally accepted policy for access to data. The tension between claimed need for cost recovery and the societal benefits of free data sharing is the crucial issue in most countries when designing spatial information strategies.

Even if it sometimes may be hard to prove to traditional treasures, conventional wisdom suggests that considerable benefits flow from a well developed Spatial Data Infrastructure.

By creating an infrastructure and the relevant linkages positive results will emerge. Clear responsibility for data maintenance and upgrade will be established, duplication will be reduced and analysis improved. Sound decision-making processes are developed for governments at all levels, and valuable information is created for academic institutions, the private sector and the community. Throughout this environment there is a general expectation for the public sector to play a co-ordinating role in developing the spatial data infrastructure and for governments to initiate this process "for public good". (Grant, 1999).

Examples of the Danish approach to design of concepts for spatial data infrastructures are given below.

The GIS Concept

The Danish concept for integrated land administration is organised as a network of interactive subsystems containing the most relevant information. The cadastral register was computerised during the period 1984-86. The Land Registry will be computerised

before the end of 1999. The computerisation of the old analogue cadastral maps was ongoing for about ten years and was completed by the end of 1997. The remaining components of the system have been computerised for a number of years. The system is illustrated in figure 5.

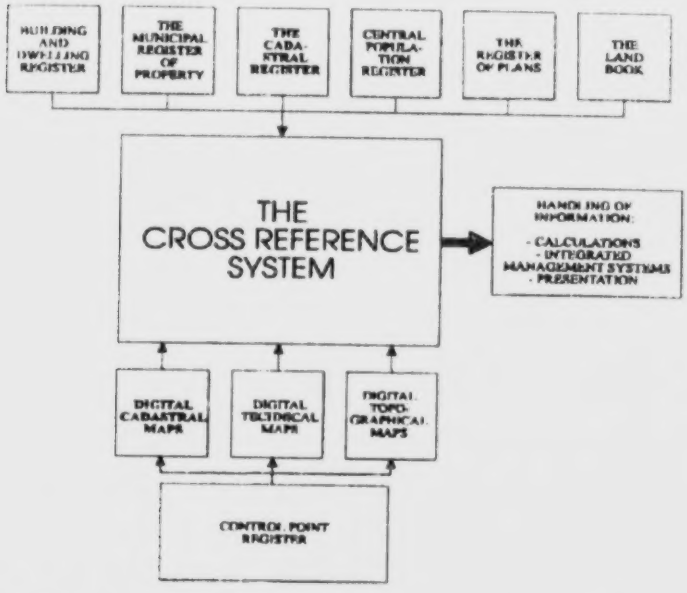


Figure 5. The Danish GIS concept for land and property data. The system includes a number of interactive subsystems linked together through the Cross Reference Register

The automatic linkage between the subsystems is achieved by establishing the Cross Reference Register, which contains all key identifications within each of the subsystems (e.g. the parcel number, the building number, the address, etc.) and the cross-reference between these identifications. This means that it is possible to obtain all available information on a specific property or building by knowing only one of the keys. Furthermore, the identification-keys are linked into the relevant physical element represented in the digital maps, e.g. the parcel, the building, etc.

Originally, only the Cadastre, the Land Book and the Municipal Register of Properties were born with a cross-reference being the cadastral identification of the land parcels. The various other real property registers are established for specific administrative

purposes. The Cross Reference Register was then established to provide the interaction between all separate registers. The same result could have been achieved by gathering all real property information in just one big register. This was, however, never considered as an adequate solution in Denmark.

The main feature of this cross-reference concept is that the daily running of the individual subsystems is decentralised in such a way that the maintenance should relay on an integration of the data-collection within the administrative routines. The responsibility for the vitalisation of the systems should rest with those (custodians) who need the data and therefore care for the updating procedures and the applications as a part of their daily administrative routines. The digital cadastral system is designed for application into this GIS-concept, and the benefits for improving the process of land management should be obvious. (Enemark, 1994)

The Planning Concept

The system of Planning Control is based on the principle of framework control, in which plans must not contradict the planning decisions at higher levels. The county councils carry out regional planning with emphasis on the regional infrastructure and the sectoral interests of the countryside. The municipal councils are responsible for municipal planning with emphasis on the local issues and the function and development of the urban areas. The municipal councils are also responsible for the legally binding detailed planning of specific neighbourhood areas, and for the granting of building permits that serve as a final control-plug in the system (Enemark, 1999).

The system of planning control is supported by a number of the sectoral land-use acts such as the Agricultural Holdings Act, the Environmental Protection Act, and the Nature Protection Act. The sectoral land-use provisions are managed by the county and municipal authorities on the basis of sectoral land-use programmes that also form the basis for comprehensive planning at regional and local level.

Furthermore, the system of planning control is supported by appropriate and updated Land-Use Data Systems, such as the Cadastral Register, the Land Book, and the

Building and Dwelling Register. These registers are organised to form a network of integrated subsystems and are connected to the cadastral and topographic maps. The total land-use management concept is presented in Figure 7.

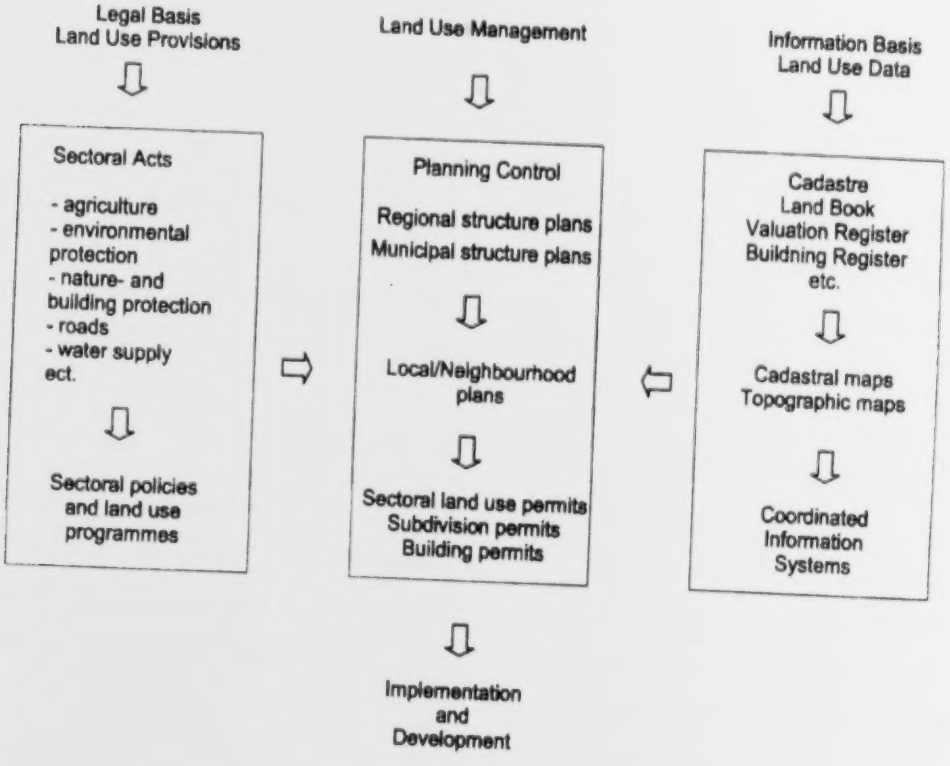


Figure 7. The Danish Concept for Land Use Management

The cadastre is increasingly used as a basic instrument in the planning process. Some local authorities use the cadastre map as the basic layer in the municipal structure planning. This digital process provides a number of opportunities. The land-use regulations are easily identified on the relevant properties with links to the addresses and name of the owners. The detailed regulations such as zoning and building restrictions can be identified on the relevant properties and located according to the property boundaries. This facility is also used when presenting the planning regulations on the Internet. The citizens can then achieve any relevant planning information just by asking for the specific property.

The WWW is increasingly seen as the best alternative to delivering spatial information by public bodies to the public and to professional business but also between public bodies. And some government organisations are increasingly seeing their information strategy based on the WWW. The decentralised databases and map servers now allow government institutions to combine cadastral information with different kind of land and property information that in an interactive way show the legal situation of land to any kind of Internet users.

The Danish municipal and county administrations increasingly present all relevant land use information including restrictions and responsibilities on the WWW. This trend is becoming vital to the management of land resources and it contributes to sharing also the democratic process of political decision-making regarding land use issues.

The educational challenges

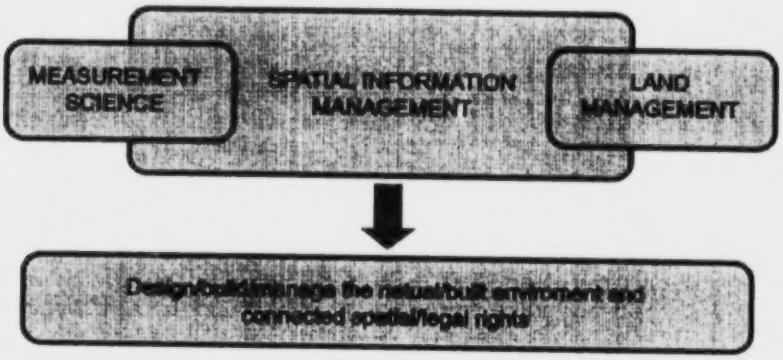
The developments as discussed above have a significant educational impact. Taking a land administration approach to surveying education, there is a need to change the focus from being seen very much as an engineering discipline. There is a need for a more managerial and interdisciplinary focus as a basis for developing and running adequate systems of land administration.

Surveying and mapping are clearly technical disciplines (within natural and technical science) while cadastre, land management and spatial planning are judicial or managerial disciplines (within social science). The identity of the surveying profession and its educational base therefore should be in the management of spatial data, with links to the technical as well as social sciences.

The systems of land administration have moved away from being "provider" driven to now being "user" driven. They are interdisciplinary by nature and they will require skills for management and problem-solving in order to serve their clients. The ability to access, to interact with and to contribute to a wide range of public and private databases at a distance will become the norm in many areas of surveying. Again, this will change

the skill-base of the surveying workforce, the structure of the organisation and, especially, the tasks of those surveyors holding managerial responsibilities.

The challenge of the future will to implement this new IT-paradigm and this new interdisciplinary approach into the traditional educational programmes in surveying and engineering. A future educational profile in this area should be composed by the areas of Measurement Science and Land Management and supported by and embedding in a broad interdisciplinary paradigm of Spatial Information Management. Such a profile is illustrated in the figure below.



THE EDUCATIONAL PROFILE OF THE FUTURE

Another educational challenge relates to the concept of lifelong learning. It must be understood, that university graduation is not the end in itself but only the fist step in a lifelong educational process. There was a time when one qualified for life, once and for all. University graduation was the ticket for a lifelong professional career. This is no longer true. Today, one must qualify constantly just to keep up. The idea of "learning for life" is replaced by the concept of lifelong learning. The response of many professions to this challenge has been to promote the concept of Continuing Professional Development (CPD).

It is also recognised that there is a significant need for capacity building in this area of interdisciplinary land administration, especially in developing countries and countries in transition, to deal with these complex issues of building sustainable infrastructures.

Capacity building in land administration is not only a question of establishing a sufficient technological level or sufficient economic resources. It is mainly a question of understanding the interdisciplinary and cross-sectoral nature of land administration systems and understanding the need for human resource development in this area. The capacity building should ensure, that the focus be more on building sustainable institutional infrastructures rather than building just high level IT-infrastructures.

The Institutional challenges

As stated in the introduction, the issue of establishing appropriate institutional and organisational infrastructures is seen as a crucial key for achieving sustainability in any society. In a theoretical sense, "institutions are the rules of the game in a society or, more formally, the humanly devised constraints that shape human interaction" (North, 1990). Institutions are the formal and informal rules, norms and standards guiding human choices and behaviour. It also includes implementation aspects such as enforcement mechanisms. Agencies, organisations and persons are actors. North uses the analogy of a football match. The institutions are the rules of the game; the teams and players are the actors. Property right is such an institution in society and the cadastre plays a most important role to make the institution of real property right work by facilitating and reducing the costs in a variety of transactions such as land transfers, land taxation and control of land use and land development.

Another institutional challenge is about establishing a suitable balance between national policy making and local decision-making. This challenge relates to the issue of decentralisation with regard to the delegation being made between governmental levels. This issue is addressed below and relates very much to the trust which the local community culturally is prepared for to have in the outcome of the decision making process.

SUSTAINABLE DEVELOPMENT

A global approach to land management, as presented above, depends on appropriate structures of governance. In this regard, the issue of decentralisation may be seen as a significant key to achieving the general aim of sustainable development.

Decentralisation of land-use planning and decision-making immediately raise the question of suitable local institutions and organisations for managing these tasks. Such local institutions and organisations must be able to handle conflicts in a very concrete and direct sense. In the context of sustainability, the conflict between immediate gains and needs on one hand, and the concern of future generations on the other, is of course crucial. This relates to the core content of the term "sustainable development" defined as "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Commission, 1987).

In the Nordic setting, and many other places around the world, the obvious local arena for land-use planning and decision-making has been the commune - the municipality. The concept of decentralisation has developed through the 1900´s. A breakthrough, as described above in the case of Denmark, was achieved in the early 1970´s by implementing the reform of local governance. The objective of this reform was to establish local authorities being sustainable in a political and economical sense and being able to manage an increasing number of tasks transferred from the national to the local level.

This movement of decentralisation was based on democratic ideals or conceptions such as to establish a local representative democracy comprising a decentralised comprehensive approach to local self-government and a local modernised unitary administration. These ideals developed in society through the second half of the 1900´s and they are still developing. Today, the conceptions regarding local self-government are directed more towards expectations of prosperity and performance of balanced control towards sustainable development in a local as well as global sense. For example, it is politically understood that environmental problems can only be solved by involving/mobilising the local people.

Subsidiarity

The principle of subsidiarity is useful in considering the role of central and local government in land-use management for sustainability. Subsidiarity governs the

distribution of competencies between jurisdictional levels in federal countries and is also used in the allocation of competencies between the national, regional and local level. The general principle is that competencies should rest with the lowest possible level of jurisdiction.

This principle is well known in the economic literature and has recently been formally adopted by the European Commission. Such decentralised provision, it is argued, will produce not only more efficient service through making better use of local knowledge, but it will also lead to greater participation and democracy, increased popular consent to government, and hence improved political stability. It should also produce increased resource mobilisation and reduced strain on central finances, greater accountability, and more responsive and responsible government in general. Therefore, it is not surprising that many countries have seen decentralisation in and of itself to be intrinsically valuable (Bird, 1994).

Another argument is, that whatever outcome may emerge from a decentralised system of decision-making it must be assumed to be the right decisions in relation to local needs. Decentralisation thus institutionalise the participation of those affected by the local decisions. This argument is particularly valid in the area of land-use decision-making and administration. Land-use planning this way becomes an integrated part of local politics within the framework of plans and policies provided at regional and national level.

In the Nordic setting, the decentralised model is based on a cultural tradition which strives for a broad political and social consensus. The concept of decentralisation comprises a precise and finely tuned relationship between a strong national authority and autonomous county and municipal councils, based on a series of laws that establish which decisions are to be delegated. The purpose is to solve the tasks at the lowest possible level so as to combine responsibility for decision making with accountability for financial and environmental consequences (Enemark, 2000).

However, the distribution of competencies between national, regional and local level will vary depending on governmental structures and the capacity and maturity of

institutions at different levels. This is particularly important in the case of countries in transition. Strict adherence to the ideal of local decision making may be counter-productive as important competencies were decentralised to regional and local government institutions before they were operating effectively (Nadin, 1999).

Sustainability

Environmental sustainability requires action at all jurisdictional levels. There are obvious global and transboundary environmental issues that need to be addressed at the international and national level. It is also generally agreed that the search for solutions to unsustainability should be concentrated at the regional and local level. This includes the complex task of policy integration through local decision making.

Central government is of course responsible for providing guidance and control within the various sectoral policy areas such as transport, housing, nature protection etc. This includes a number of potential conflicts since the policies may contradict in a way that can hardly be solved only at national level. However, in the case of Denmark, the strict sectoral traditions of handling their own affairs are now increasingly being influenced by a more integrated and environmentally sound approach. A number of action plans have been launched for providing sustainability for sectors such as energy, transport, tourism, and agriculture.

Using the Danish example, sectoral policies are implemented in different ways. Some areas such as pollution control, agriculture and nature and heritage protection are mainly implemented through vertical connection, by setting standards and regulations at national level to be administered at regional or local level. Other areas, such as transport and energy, provide a rather firm framework at national level to be further detailed through sectoral and comprehensive planning at regional and local level. Finally, areas such as housing, the environment, nature and resource management, tourism and economic development are organised by fulfilling the overall national policies through efforts of comprehensive planning based on regional and local considerations and needs.

The impact of central versus local government in support of sustainable development is a mix of vertical connections where each sectoral policy is implemented by a top- down approach; and horizontal connections where the different sectoral policy areas are balanced on the same level through comprehensive spatial planning. A sustainable approach to land use management is achieved through the planning system where plans must not contradict decision at higher levels. This principle of framework control ensures, in principle, that the regional and local decision making will be in conformity with overall national policies.

The means to make this system work are monitoring, dialogue and the national power of vetoing a proposal for a regional structure plan or a local/neighbourhood plan. The means of veto is replacing national adoption of the plans. To facilitate the planning process and to avoid the use of veto, a comprehensive national report is prepared prior to every four-year revision of the regional plans. The report presents the current preconditions for managing the national aims and objectives within specific and topical policy areas. Through this report, national interest are considered, discussed and dealt with prior to the process of revising the plans every four years. A national veto can also be imposed against a local/neighbourhood plan when national interests are at stake. The means of monitoring, dialogue and veto work this way to achieve a sustainable balance between the three levels of administration.

FINAL REMARKS

The Bathurst Declaration established a powerful link between appropriate land administration and sustainable development. This should also be seen as a result of the gradual evolution of land administration systems over time from a specific land tax and land market focus to a more managerial and multi-purpose role. This multi-purpose role should provide adequate spatial information infrastructures as a basis for sustainable decision making in all land related matters. Sustainable development is not attainable without sound land administration.

This demand for sound land administration infrastructures also requires support from a well developed spatial information infrastructure for sharing geo-referenced

information. This includes the need to adequately address conceptual issues as well as policy issues such as data access, intellectual property, cost recovery, and design of an efficient institutional framework.

A global approach to land management depends on appropriate structures of governance. In this regard, the issue of decentralisation may be seen as a significant key to sustainable development. Means of planning control, understood as land use planning and/or sectoral policy integration, play a crucial role to apply sustainable principles at all governmental levels. These principles relate to sustainable development in its broadest sense including economic, social and environmental aspects.

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